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Rigid-plastic finite element simulation of deformation mechanisms during rolling of complex sheets containing an inclusion

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Abstract

Using rigid-plastic finite element DEFORMTM 2D software, this study simulates the plastic deformation of complex sheets at the roll gap during the sheet rolling process. Specifically, the study addresses the deformation of complex sheets containing inclusion defects. Under various rolling conditions, the present numerical analysis investigates the damage factor distributions, the void length at the front and rear of the inclusion, the deformation mechanisms, and the stress-strain distributions around the inclusion. The relative influences of the thickness reduction, the roll radii, and the friction factors on the void length at the front and rear of the inclusion, respectively, are systematically examined. Additionally, the correlation between the front and rear void lengths and a series of damage factors is explored. The simulation results appear to verify the suitability of the DEFORMTM 2D software for modeling the rolling of complex sheets containing inclusions.

Key words: Complex Sheet Rolling; Defective Inclusion;
Finite Element Simulation